NAVAL POSTGRADUATE SCHOOL
Monterey, California

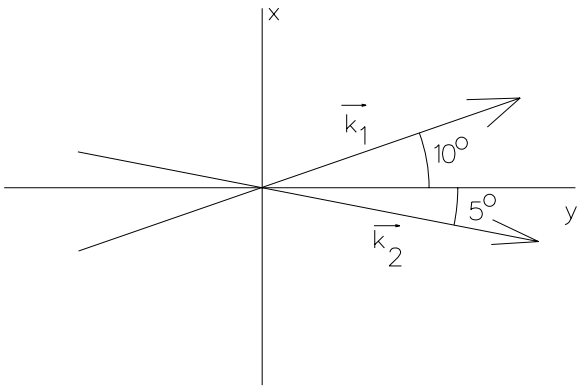
EC 3210 MIDTERM EXAM I 10/92 Po

- This exam is open book and notes.
- There are three problems; each is equally weighted.
- Partial credit will be given; be sure to do some work on each problem.
- Be sure to include units in your answers.
- Please circle or underline your answers.
- Do *NOT* do any work on this sheet.
- Show *ALL* work.
- Enter your name in the space provided.

1	
2	
3	
Total	

Name: _____

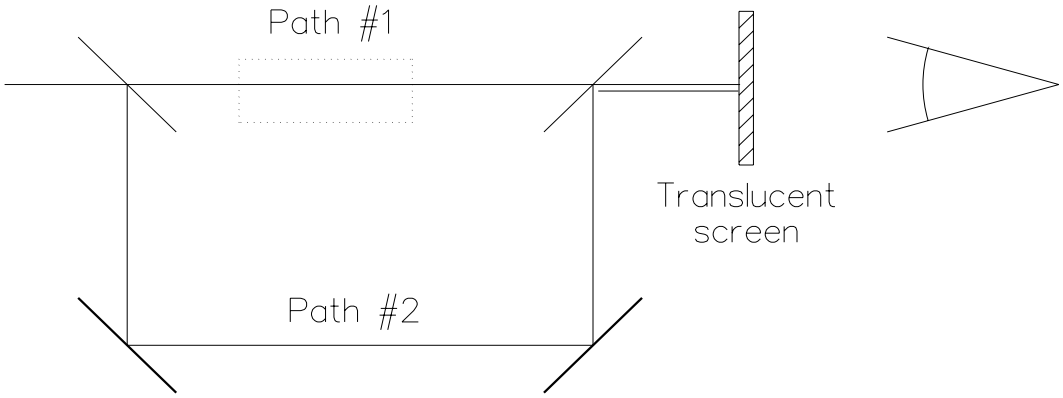
1. Consider two unit–amplitude plane waves propagating in the y–direction with $\vec{k}$–vectors as shown (the angles are enlarged for clarity). The phase of wave #1 is 30° and the phase of wave #2 is 145°. The frequency of the waves is 6×10^{14}. Write complete expressions for $E_1(x, y, z, t)$ *and* $E_2(x, y, z, t)$.



---

2. Consider the Mach–Zender interferometer shown below. It is used with an argon laser ($\lambda = 488$ nm). With air in both paths, the fringe spacing is found to be 300 μm.

   If a piece of transparent plastic ($n = 1.8$) that is 3 cm long is placed in path #1, calculate the displacement of the fringes (in units of meters) at the observation screen.



---

3. Design a polarizing prism made out of ADP and optical cement ($n = 1.4$) to produce horizontally polarized light. The input face of the prism should be 3 cm x 3 cm.

   Provide *all* significant dimensions, as well as the orientation of the fast and slow axis of the crystal (relative to horizontal).